MicroConverter G.704:
MTU9005

MicroConverter G.704
(48VDC):
MTU9005-48

MicroConverter G.704

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Introduction

The MicroConverter G.704 from Black Box is a derivative of the highly successful MicroConverter SP-3 SRA. The MicroConverter G.704 has been engineered to reduce cost and increase functionality in this expanding sector of the market for G.703 / G.704 Data Service Units (DSUs). It is designed to enable the connection of data communication systems to carrier services, or private services, such as microwave links, that are presented as G.703 at 2Mbit/s and required fractional Nx64k data rates or support for the G.704 framing protocol. The standard model supports X.21 and V.35 DTE, and both 75-ohm un-balanced termination and 120-ohm balanced termination of a G.703 network. The default configuration is X.21 and 75-ohm operation. To change to V35 or 120-ohm operation, please contact your local Black Box technical support.

Installation

Unpacking

On unpacking the managed version of the MicroConverter G.704 you should find the unit, a management control cable, and this manual. All units have an integral power supply. Mains powered units have an IEC connector and are delivered with a power lead. DC powered units are available as an option. If there are any questions please contact your local Black Box technical support.

Connection to a 75-ohm un-balanced G.703 / E1 network

If the unit is being used on a 75-ohm un-balanced service then it should be connected using the two B.N.C. connectors on the rear panel of the MicroConverter G.704. These are labelled as "Rx" and "Tx". Your G.703 carrier service equipment may be labelled with transmit and receive. The MicroConverter G.704 "RX" port should be connected to the receive side of the carrier equipment. The MicroConverter G.704 "TX" port transmits carrier and this should be connected to the out-bound port of the carrier service. Switches two and three on the SW1 switch bank should be in the down/on position.

Connections should be made using 75-ohm coaxial cables with B.N.C. connectors. The coax cables required are two off, 75-ohm coax cables, of 5mm diameter, which must be terminated with male B.N.C. connectors. Cables are available from Black Box, please contact your local technical support.

Connection to a 120-ohm balanced G.703 / E1 network

If the unit is being used on a 120-ohm balanced service then it should be connected using the RJ45 connector on the rear panel of the MicroConverter G.704. This is labelled as RJ45. Units are shipped with the interface set up for 75-ohm operation. To enable the 120-ohm balanced operation set the middle two switches (switches two and three) of the SW1 switch bank to the up/off position. The pin out for the RJ-45 is as defined for ONP/CTR-12 and is given in the specification section.

Status Indicators

There are five LED status indicators on the front panel of the MicroConverter G.704. These are labelled "TT Clock", "Loop Back", "ClockMaster", "Network" and "Power". The "Network" indicator is illuminated when the MicroConverter G.704 is receiving correctly encoded data from the line interface equipment. The "TT Clock" LED will illuminate when the use of the Terminal Timing option is selected. The "Loop Back" LED will illuminate when the loop-back condition is selected. The "Clock-Master" LED will illuminate when the MicroConverter G.704 is set to clock master mode. The “TT Clock”, “Loop Back” and “Clock Master” functions are selected / enabled via the async management control interface.

Clock master / clock slave settings

When using a pair of MicroConverter G.704 systems at either end of a 2048kbit/s clear channel circuit, one of the units should be set to clock master, from the management control interface. If the circuit is structured (G.704) both units should be clock slaves.

Switch functions and default settings

Switch Bank SW1	Default
Switch 1 Optional ground for RJ45 Receive Shield	Up/Off
Switch 2 Enable 75-ohm operations on Tx on BNC	On/Down
Switch 3 Enable 75-ohm operations on Rx on BNC	On/Down
Switch 4 Not used / no function	Up/Off

Note: A change to the configuration table is also required.

Switch Bank SW2	Default
Switch 4 Local and remote loop back when down / on	Up/Off
Switch 10 Inhibit clear channel operation when up / off	Up/Off
Enable clear channel operation when down / on	

Management functions

The managed version of the MicroConverter G.704 is delivered with a 2M RJ45 to DB9 management cable. This cable is designed to plug into the RJ45 management port on the front of the MicroConverter G.704. It should not be plugged into the network port (RJ45) on the rear of the unit. The DB9 is designed to plug into the COM port of a PC or laptop computer. The management is supported by an async command line protocol, 8-bit, no parity, one stop bit at 9600 baud, supported by most standard terminal emulation packages.

Commands

Commands may be equipped with options, which need to be typed after the command name.

<Command> [<opt # 1> <opt # 2> . . . . <opt # n>]

Each option is to be delimited by one (or more) white space (not tabs). The command line is then delimited by a carriage return.

Unrecognised commands, or no command will result in the error message 'Command not found'.

Commands with illegal, or unrecognised options will result in the error message 'Syntax error'.

All commands are case insensitive, however, they are written in capitals in this document for clarity. It is usual to use lower case in practice. **The command line is limited to 22 characters, including the command itself and spaces.**

Command prompts

There are three command prompts. Each reflects a different system status:

'Changed>'	The system configuration has not been updated since the last changes to the working configuration. Also the system configuration may not have been saved to the non-volatile storage since the last system update.
'Unsaved>'	The system configuration has been updated since the last changes to the working configuration, but has not been saved to the non-volatile storage.
'>'	The system configuration has been updated since the last working configuration change & the system configuration has been saved since the last update.

Command set

1. **TSEN – Timeslot enable**

Syntax: TSEN [<timeslot number>, (<timeslot number>, . .)]

Description: Enables Timeslots on serial interface. 'timeslot number' >= 1 <= 31. The command line length limits the number of timeslots that can be enabled by one command. If TS0 is enabled, clear channel mode is assumed. If TS0 is disabled & TS16 is enabled, TS16 signalling is disabled.
(a or A for all)

For clear channel operation SW10 must be down / on

2. TSDIS – Timeslot disable

Syntax: TSDIS [<timeslot number>, (<timeslot number>, . .)]
Description: Disables Timeslots on serial interface. 'timeslot number' >= 1 & <= 31. The command line length limits the number of timeslots that can be disabled by one command. If TS0 is disabled, G.704 framing is assumed. IF TS0 & TS16 are disabled TS16 signaling is enabled. (a or A for all)

3. UPDATE – Update system configuration

Syntax: UPDATE
Description: Transfers the working configuration to the system.

4. UNDO – Undo working configuration changes

Syntax: UNDO
Description: Overwrites the working configuration with the current system settings.

5. STATUS – display configuration & status information

Syntax: STATUS [<cycle timer>]
Description: Displays the working & system configurations, & the system status information. If the 'cycle timer' option is present, the cycle mode is entered & the status command will be executed periodically.
'Cycle timer' >= 0 & <= 120 seconds. If the status command is executed with a cycle timer of '0', or it is omitted, the status will be displayed immediately & the cycle mode will be terminated.

6. READ – read configuration from non-volatile storage

Syntax: READ
Description: Overwrites system & working configurations from non-volatile storage.

7. SAVE – save configuration to non-volatile storage

Syntax: SAVE
Description: Saves the current system configuration in non-volatile storage. Failure to use this command will result in the loss of any new configuration if the unit is powered off.

8. CRC4 – enable / disable CRC4

Syntax: CRC4 <ON / OFF>
Description: G.704 CRC4 control

Option	Description
'OFF'	Disable CRC4
'ON'	Enable CRC4

Notes:
TS0 must be disabled for serial data i.e. not clear channel set up.

9. MCLK – enable / disable master clock mode

Syntax: MCLK <ON / OFF>
Description: Clocking master control
Option
Description

'OFF'
System clock recovered from network

'ON'
System clock generated on-board

Notes:
Each end of a link must be set differently when using a pair of units in 2048kbits/s clear channel mode.

10. IMP – select network interface impedance

Syntax: IMP <75R / 120R>
Description: Selection 75 / 120R interface
Option
Description

'75R'
Impedance for BNC connection

'120R'
Impedance for RJ-45 connection

Notes:
SW2 & internal links are also required in order to operate correctly.

11. NAME – set system name

Syntax: NAME <system name>
Description: Sets system name. Max length is 16 characters & can include most characters (including white space). Alpha characters are converted to uppercase.

Note: The following parameters should not be changed unless specifically required for your network.

12. DINV – enable / disable data inversion

Syntax: DINV <ON / OFF>
Description: Data inversion control

Option	Description
'OFF'	Normal operation
'ON'	Data inverted

13. CINV – enable / disable clock inversion

Syntax: CINV <ON / OFF>
Description: Serial clock inversion control

Option	Description
Notes	
'OFF'	Normal operation
'ON'	Clock inverted

14. TTC – enable / disable terminal timing

Syntax: TTC <ON / OFF>

Description: Terminal timing control. TxD can be clocked into the MC G.704 M using the TTC signals which are usually the CLK signals looped back at the far end of the cable in order to eliminate cable skew.

Option	Description	Notes
'OFF'	TxD sampled by CLK signals	
'ON'	TxD sampled by TTC signals	

Notes:
TTC is inverted by the CINV command.

15. LBACK – enable / disable loop-back mode

Syntax: LBACK <ON / OFF>

Description: Loop-back test mode control. Serial TxD I/P is looped back onto RxD O/P. Network RxD I/P is looped back onto TxD O/P. If TS0 is selected for serial transmission then clear channel mode is assumed, otherwise G.704 framing is adopted.

Option	Description	Notes
'OFF'	Normal operation	
'ON'	Serial & network loop-back	

Notes:
Network loop-back mode is dependent on TS0 configuration.

Approvals

CE Mark

Electromagnetic Compatibility

This device complies with the following standards in accordance with the European Directives 89/336/EEC and amending directives 91/263/EEC, 92/31/EEC, 93/68/EEC

Immunity EN 50082-1 06/92
Emission EN 55022 class B 08/87

Safety

In accordance with European Low Voltage Directives 73/23/EEC, 93/68/EEC and Telecommunication Terminal Equipment Directive 91/263/EEC amending directive 93/68/EEC, this device complies with the following standards: EN 60950:1992 + A5 and EN 41003 08/93
The ports on this unit have the following safety status:

DTE (X.21 / V.35) = SELV
Network Interfaces (G.703) = SELV(SELV = Safety Extra Low Voltage)

These definitions are classified as per standard EN 60950:1992 + A5.

DTE Port

This product is approved to EN 55022, connection of unapproved cables or equipment may affect EMC product performance. Interconnection circuits must comply with the requirements of EN 60950:1992 + A5 for SELV circuits.

BABT Approval

Approved by BABT for connection to:

Private Circuits and Interfaces in the European Economic Area compatible with G.703 (120Ω) at 2,048 kbps Unstructured.
Private Circuits and Interfaces in the United Kingdom compatible with G.703 (75Ω) at 2,048 kbps.
BABT Approval number : 650250.

Specifications

On Board Master Clock

Operating Frequency: 2.048 MHz + 50 PPM @ 25 deg. C

Network Interface Signals Specification

The Network Interface conforms to ITU specification G.703 / G.704 and ETSI Open Network Provision for digital unstructured / structured leased line (D2048U / D2048S).

Transmit.	
Output Pulse amplitude	2.37 V into 75R ± 10% 3.00 V into 120R ± 10 %
Return Loss	Min 8 dB - Max 14 dB

Receive.	
Sensitivity Below (0dB = 2.4 V)	- 10dB
Loss of Signal Threshold	0.3V
Return Loss	18 dB
Allowable consecutive Zeros before LOS	190 bits.

Mechanical

The network signals are offered up to the network on two 75R Coax or an RJ45 socket.

Pin on RJ45	Function
1 & 2	Rx pair from network
3	Shield reference point
4 & 5	Transmit pair to network
6	Shield reference point

Note that the Receive Shield reference point is taken to ground via switch one of the SW1 switch bank. Moving switch one to the down/on position connects Receive Shield to ground.

Environmental

The MicroConverter G.704 is designed to operate under the following conditions:

- Ambient temperature in the range of 5 to 45 degrees Celsius.
- Relative humidity of 10 to 90 percent (non-condensing).
- Atmospheric pressure 86kPa to 106kPa.
- Power Options: 220 - 250VAC, 50Hz, 100mA or 90 - 260VAC, 50Hz, 100mA or 36 - 72 V DC, 200mA

Appendix A- Safety Warnings

Check that the input voltage marked on the rear of the unit is suitable for the intended installation. If in any doubt, consult Black Box technical support.

Mains powered units:- In the event of a problem the unit must be disconnected from the mains by isolation at the mains socket. The unit must be connected only to an easily accessible mains outlet.

DC powered units: - In the event of a problem the unit must be disconnected from the DC supply by removing the DC input connector on the rear of the unit.

The unit contains no user serviceable parts. All servicing must be carried out by qualified personnel only.